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New South Wales

(NEW SOUTH WALES.)

DEPARTMENT OF MINES AND AGRICULTURE.

GEOLOGICAL SURVEY.

E. F. PITTMAN, A.R.S.M., Government Geologist.

STORAGE

MINERAL RESOURCES.

No. 10.

ENGINE STORAGE

REPORT

ON THE

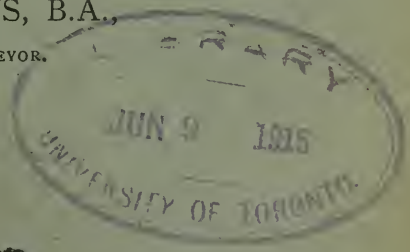
KIANDRA LEAD.

BY

E. C. ANDREWS, B.A.,

GEOLOGICAL SURVEYOR.

1901.



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NEW SOUTH WALES.

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Geological Survey of New South Wales,
Department of Mines and Agriculture.

Sydney, 17th July, 1901.

Sir,

I have the honour to submit for publication No. 10 of the Mineral Resources Series, entitled, "Report on the Kiandra Lead," by E. C. Andrews, B.A., Geological Surveyor.

The gold deposits of Kiandra were discovered in 1859, and quickly attracted about 15,000 persons to the locality; but the rich shallow alluvials were soon worked out, and the greater part of the population then departed.

The deep Tertiary lead, from which the shallow gold deposits had been s̄ned, was known to occur in close proximity to the first settlement, and its exposed edges, on the slopes of the hills, received some attention from the pioneer miners, and have been worked in a desultory manner by hydraulic sluicing almost ever since; but it is not practicable to work the central portions of the lead by that process, because of the thick overburden, consisting of beds of lignite and clay, and a capping of basalt, amounting to several hundred feet in the aggregate. Some parts of the deep lead have also been exploited by tunnelling. It is evident, however, that a considerable amount of capital is required to systematically work these deposits, which are of great length and width, have a rather irregular bottom, and are troubled with a considerable quantity of water.

With the object, therefore, of attracting attention to this important but comparatively neglected goldfield, it was thought advisable to have a geological survey of it made, and the course of the lead defined. One of the results of Mr. Andrews' work has been to show that there are two distinct Tertiary river deposits, which he has named respectively the Kiandra Lead and the Round Mountain Lead.

I have the honour to be,

Sir,

Your obedient servant,

EDWARD F. PITTMAN,

Government Geologist.

The Under Secretary for Mines and Agriculture.

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INTRODUCTION.

THE great extent of basalt with underlying drift at Kiandra has long been known to the mining community. Many attempts have been made to prove the auriferous nature of the wash, but they have, for the most part, been conducted in a haphazard fashion.

The following report, with plans, sections, and photographs, has been prepared with the object of showing the extent, probable nature, and auriferous character of the lead.

I desire here to cordially thank Mr. A. R. Winekler for much valuable information and assistance in the field; also Mr. J. M. Lette, Mr. A. Reeckmann, Mr. C. L. V. Jackson, B.E., Mr. Eastwood, Mr. Hetherington, and Mr. C. Burgess, for their kindness in showing me various points of interest in the locality, and in furnishing any information at their disposal concerning the lead.

The maps and sections have been prepared by Mr. O. Trickett, L.S. I desire also to thank Mr. C. E. Murton, Field Assistant, for his cordial co-operation in the work.



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REPORT ON THE KIANDRA LEAD.

HISTORY.

KIANDRA (a corruption of the word Giandarra) Gold-field broke out in November, 1859, with the discovery of payable gold in Pollock's Gully by Gillon, Hayes, and Grice.

The first gold had been found, however, in Bullock Head Creek by the Pollock Bros., who were accustomed to bring sheep from the Murray to Kiandra in summer, and, while the flocks were feeding, to spend most of their time in prospecting.

The Pollocks on their return reported the find in Tumberumba. In December, 1859, and January, 1860, a great rush to Kiandra set in.

In February and March it was estimated that 15,000 men were on the field.

The country to the south being exceedingly rough, a surveyor named Ligar devised a route for the Victorian miners by way of the Upper Murray, coming into Kiandra through Happy Jack. This was known as Ligar's Route.

As the diggers swarmed along this and other routes they prospected the area in the neighbourhood of Table Top Mountain and the Four Mile.

Towards the end of January, 1860, the Four Mile rush took place, and about 1,000 miners were soon employed on the spot, many of them making small fortunes.

The Nine Mile also broke out at this time, and kept another 1,000 people employed. The finds here were almost phenomenal.

A week after the Nine Mile rush took place exceedingly rich prospects were found at the Tumut River, on Benjamin's Flat, near the intaking of Scott's Gully and Nine Mile Creek.

The rich properties in the localities just mentioned were almost always confined to small watercourses leading up to the basalt-capped hills, which stretch for a distance of ten miles both north and south of Kiandra.

The following newspaper extracts explain the state of affairs in Kiandra during February, March, and April, 1860:—

“One party consisting of four men got 120 oz. in the week, another party of three were getting 20 oz. per day. Several large nuggets found—6 lb., 12 lb., 14 lb. Another party getting 1 lb. weight gold per diem. The gold procured is coarse and scaly, and large specimens blended with quartz and all much waterworn.”—(*Sydney Morning Herald*, 23rd February, 1860.)

“One party before dinner got 176 oz., and another got one lump weighing 19 lb.”—(*Sydney Morning Herald*, 25th February, 1860.)

“Five hundred ounces of gold are being got daily. In one dish yesterday they got 21 dwt., and to-day they got 7 lb. weight of gold. One of the party told me they had averaged 20 oz. per day from the beginning. I heard of another party of twelve men getting £73 worth of gold for last week's work.”—(*Sydney Morning Herald*, 2nd March, 1860.)

"I saw 80 oz. of gold washed out of one claim in the day's work, and several are turning out 50 oz. per day. These are the best claims from the Surface Hill in the middle of the plains to the edge of the plains where the river begins. The Commissioner has taken with him to Sydney a nugget weighing 48 oz., and another weighing 20 oz., besides a large quantity of coarse gold. The diggers wash out the boxes twice a day. An ordinary yield of gold is from 60 to 70 oz. before dinner and from 30 to 40 oz. at night. Elliot and party of four washed out 80 oz. last week from surface diggings. D. Scully and party have averaged 21 oz. a day for five or six weeks; so have others, some claims have turned out as much as 100 oz. of gold per day, and many as much as 40 and 50."—(*Sydney Morning Herald*, 7th March, 1860.)

"Over an area of half a square mile the workings have proved as rich as any ever discovered in Victoria or California. But, singular to say, beyond this particular spot on the river the precious metal is obtainable only in very small quantities indeed. * * * The Commissioner computes the daily average yield of Kiandra diggings at 500 oz. to a population of 2,500 or 3,000."—(*Sydney Morning Herald*, 20th March, 1860.)

"Many robberies—stickings up. Thieves get their heads close shaved or hair cut. * * * The escort with eleven mounted troopers left Kiandra on Monday with 7,469 oz. It was believed there was fully 5,000 oz. in the hands of the miners, independent of the amount brought down by the escort."—(*Sydney Morning Herald*, 5th April, 1860.)

The field was at first compared with Ballarat and Bendigo, and it was computed that after the winter of 1860 there would be 150,000 men in the locality.

Previously to the rush some exceptionally severe winters had been placed on record, the knowledge of which filled the prospectors with a wholesome dread of the approaching Alpine conditions.

For instance, Dr. Gibson, in the year 1839, had visited the locality, and, struck with the abundance of rich pasture, had erected a stockyard and brought up cattle in the fall of the year. The winter set in, with the usual accompaniment of heavy snow, and all the cattle perished.

A prospecting party on Township Hill had also come on the skeletons of bullocks hanging in the tops of the snow-gums, fully twenty feet from the ground, near the summit of the hill and a considerable distance from any watercourse. It was evident from this that the trees had been covered with snow, to enable the animals to browse off the top twigs.

For these reasons many men kept off the field until the cold weather of 1860 should pass, but the reports were so discouraging at the close of that season that the population did not increase to the extent anticipated. The maximum population was reached about March, when between 10,000 and 15,000 people were on the field. In April, 10,000 were living in the locality. In August, 4,000 were occupied at Kiandra, 200 at the Four Mile, and 400 at the Nine Mile.

The field was patchy, gold being extremely rich in certain spots, barren ground existing within a few yards of the good yields. Surface Hill and Whipstick Gully yielded many large nuggets and specimens, as may be seen by consulting the columns of the *Sydney Morning Herald* for the months of February, March, April, and May of 1860.

One was found by O'Donnell and Party on the east side of Surface Hill Reef, and alongside of the same. This on crushing yielded 28 lb. weight of gold.

On Whipstick Flat another specimen was unearthed by Hles and Party, 27 lb. weight of gold being obtained by crushing.

Many 30 and 40 oz. weight nuggets occurred in the river, and all well rounded.

The gold escort was not established for several months after the start of the field, and most of the precious metal is supposed to have been taken away during the few weeks following on its discovery, and of this no record has been kept. Nevertheless up till 30th June, 1860, the escort had taken charge of 42,000 oz.*

Shortly after the commencement of gold-mining operations at Kiandra it was found that old river drift existed in large quantities under the north and south extension of the basalt. This fact was determined by tracing the gold up the watercourses leading to the basalt cappings of the hills. In this way the Homeward Bound, Cornishmen's, Pattinson and Winckler's, the North and South Bloomfield, and Empress Claims were discovered and opened up.

The Homeward Bound was traced up from Bullock Head Creek by three prospectors, who lighted on an auriferous pothole in the old river channel under the basalt. The gold occurred in a stiff clay matrix. A puddling machine was erected here in March or April, 1860. The prospects from the pothole were good, £1 10s. to £2 a day per man being obtained when water was plentiful. The question of water was at first a great drawback in sluicing. This difficulty was overcome to a great extent in the following December, when the system of constructing races was commenced. The first of these was cut from the Three Mile to the Homeward Bound. With this the pothole was attacked vigorously. It proved to be remarkably rich, 1,000 oz. of gold being obtained.

The Cornishmen's Claim was discovered about April or May, 1860. Half an ounce a day per man was obtained by utilising a little water brought from the top of New Chum Hill.

A miner named "Joe the Frenchman" afterwards procured the claim, and, in the course of a year or two, extracted £800 worth of gold from the base of the drift.

Four Cornishmen then bought the foreigner out. Very good results were obtained by this party.

In the meantime tunnelling had been resorted to in the vicinity of the last two mentioned claims in the hope of thus winning the gold.

The first drive was started under Pattinson and Winckler's sluicing claim by Cameron and Party, who discovered gold in their workings early in 1861.

Colquhoun and Party had another claim alongside, and came on good gold also in 1861.

Drummond and Party drove along the centre of the channel in the same year. From their tunnel the returns are said to have averaged 14 dwt. per superficial fathom. These old workings have since been broken up by hydraulic sluicing in Pattinson and Winckler's Claim.

The Six Mile was worked in the latter end of 1860, £10 a man per week being obtained in the wet season.

At the Empress (Nine Mile) actual sluicing operations commenced in 1860, and were carried on intermittently till 1882.

In 1866 or 1867 the Emperor Company put in a tunnel between the Homeward Bound and Cornishmen's Claims. This helped to establish the width of the channel.

About the end of 1878 these sluicing claims were floated into what was known as the Kiandra Gold-mining Company. In 1882 the Three Mile dam was constructed and connected with the claims by means of a large headrace, 130 feet above the base of the wash.

* Rev. W. B. Clarke. Southern Gold-fields, page 267.

Hydraulic sluicing was started in these claims in 1883.* One nozzle was at first employed, but subsequently an additional one was brought into play.

The Cornishmen's, and Pattinson and Winckler's Claims were afterwards sluiced by hydraulic methods.

In the year 1882 or 1883 the Kiandra G.M. Company introduced hydraulic sluicing at the Nine Mile (Empress) Claim.

A scheme for conveying water to the nozzles from the Doubtful Creek, some 30 miles distant, was considered by Mr. H. B. Sullivan, L.S., † who took the necessary levels. It was found that two or three large gullies existed across which the water would have to be siphoned.

When the overburden at the Empress Claim reached a thickness of 150 to 160 feet sluicing was abandoned in favour of tunnelling.

At the Four Mile two sluicing claims were taken up, viz., the North and South Bloomfields. Of these, the former was started in 1862, and the latter in 1883 or 1884.

The Giandarra, Robyn's Tunnel, and All Nations' Claims, some two miles to the north of Kiandra, have all been started within the last few years.

The claims just referred to are all on the line of what is known as the Kiandra Lead.

Other sluicing claims have been opened up to the west of the Kiandra Lead; among these may be mentioned the Fifteen Mile Claim, started in 1875 by Hugh O'Connor.

Three miles thence towards the Tumut River and on the Fifteen Mile Creek the sluicing claims known as the Golden Crown and the Phoenix were started in 1883, the former being treated by nozzles.

The Eight Mile Sluicing claim, also belonging to the Fifteen Mile Sluicing Company, was started in 1883.

In all these claims great quantities of drift have been sluiced away from beneath the basalt; but their gold yields were not nearly of so profitable a nature as those derived from the Kiandra Lead.

The Kiandra Reefs.—The finding of the Jackass Flat (1860), Surface Hill (1860), Three Mile (1864), and Charcoal Reefs caused great excitement from time to time. Although the Jackass Flat and Three Mile Reefs paid handsomely at first, they were found to become practically barren at a short distance from the surface.

At present gold-mining operations at Kiandra are confined to the dredging of ground along the Eucumbene River by the Kiandra Gold-dredging Company; to tunnelling at the Empress, Giandarra, and the Six Mile; and to fossicking along Nine Mile Creek, Scott's Gully, Four Mile Creek, the Eucumbene River, Bullock Head Creek, Six Mile Creek, and Racecourse Creek.

The Kiandra bucket dredge (Plate I), working in ground turned over several times already by the diggers, wins from 30 to 35 oz. of gold per week. The revolving screen belonging to this dredge has been taken out, and a sluice-box substituted.

A considerable area has also been taken up along the Tantangara Creek for dredging purposes.

PREVIOUS REFERENCES TO THE KIANDRA LEAD.

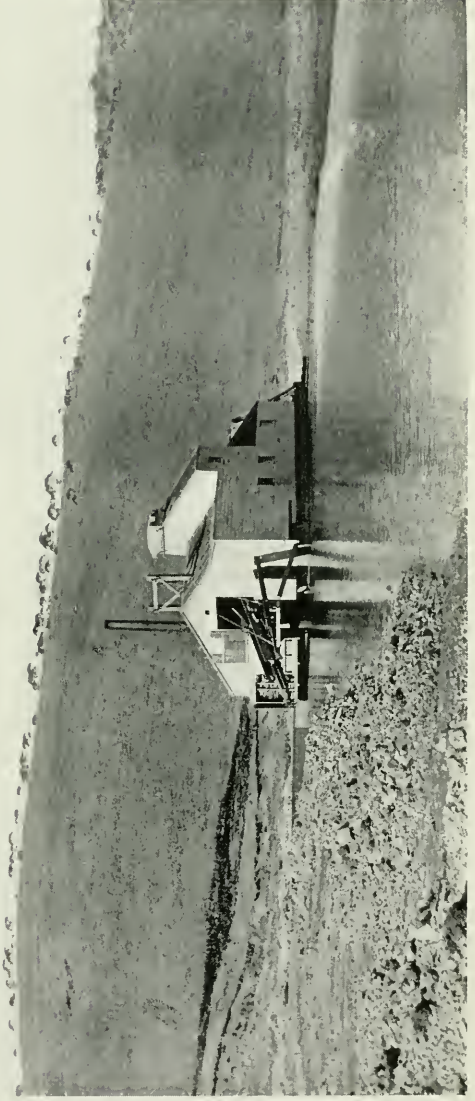
C. S. Wilkinson.—Ann. Rept. Dept. Mines for 1880 (1881), pp. 239–242.

H. B. Sullivan.—Rept. on water supply for Kiandra Gold-field. *Ibid.* for 1880 (1881), pp. 265, 266.

W. H. J. Slec.—*Ibid.* for 1885 (1886), pp. 107, 108. *Ibid.*, 1898 (1899), pp. 94, 95.

* Introduced by J. M. Lette, Esq.

† Ann. Rept. Dept. Mines for 1880, pp. 265, 266.



KIANDRA BUCKET DREDGE.

L. H. G. Young.—Report on Kiandra Gold-field, and water supply for the same. *Ibid.* for 1880 (1881), pp. 253–258.

W. Anderson.—Report on Kiandra Gold-field. *Ibid.* for 1886 (1887), pp. 165, 166.

J. R. M. Robertson.—Kiandra Gold-mining Company (Limited). Report on Kiandra sluicing claims, New Chum Hill (Fol., Sydney, 1887).

W. C. Roberts.—Report on Victoria Mines, Kiandra. Ann. Rept. Dept. Mines for 1882 (1883), p. 72.

W. D. Bailey.—*Ibid.*, pp. 71, 72.

These two reports sum up concisely all information concerning capacities of dams, lengths of races, &c., employed at Kiandra.

Various Wardens' reports are to be found in the Annual Reports of the Department of Mines, from 1875 (1876) to the present year.

PHYSIOGRAPHY.

TOPOGRAPHY.

Kiandra is situated on a high table-land determined as to its general features by the main Snowy Mountain Range, which, disposing itself in pointed-ellipse form in the vicinity of the township, so as to embrace it between its eastern and western curves, passes through to the south by way of Table Top Mountain. (Pl. II.)

The town is some 4,600 feet above sea-level, and lies 58 miles south-east of Tumut, 51 miles west-north-west of Cooma, and 40 miles north of Kosciusko.

The table-land is dotted over with numerous hills composed of tuffs, slate and granite, rising to heights of 1,000 to 2,000 feet above the general level. Among these peaks may be mentioned the Big Bogong (6,753 feet), Table Top Mountain (5,850 feet), the Round Mountain, Alpine Hill, Governor's Hill (5,723 feet), Yarrangobilly Peaks, and Peppercorn.

The main range, in the vicinity of the town, is typically flat-topped, a feature due to its basaltic capping. Through Governor's Hill (Kiandra Trigonometrical Station) the range sweeps round to the north-west by way of the Six Mile (where the basalt starts), Gooandra Trigonometrical Station, and Bullock Hill (Pl. II); thence, turning sharply on itself, it passes through the Three Mile, leaving the town to the immediate east; through Township Hill, Nine Mile, Table Top Mountain (where the basalt ceases), the Bull's Peak, and Mt. Kosciusko.

On each side of the plateau profound gorges occur, expressions of the amount of material removed by such streams as the Tumut during the process of excavating their present channels.

The Snowy Range forms the watershed for the local streams. The chief water systems are those of the Snowy and Murrumbidgee Rivers.

Inside the sharp curve formed by the main range at Bullock Hill the Encumbene gathers together its head waters, and flowing towards the south joins the parent stream (the Snowy River) at Jinderboin.

The Murrumbidgee River has, as its chief feeders in this district, the Tumut and the Goodradigbee.

The main stream rises in a mountain known as Peppercorn. Here also the Goodradigbee has its source, flowing many miles before uniting with the trunk stream.

The Tumut takes its rise in the neighbourhood of the Big Bogong and the Bull's Peak, and carves its way through the mountain blocks to the Murrumbidgee in a perfect labyrinth of gorges, some as much as 3,000 feet below the general level of the plateau.

Besides the basalt mass which forms the summit of the Snowy Range in the neighbourhood of Kiandra another and larger one apparently has its source, or one of them, in the vicinity of the Round Mountain. From this as a centre it flows in the direction of the Tumut River, through the Fifteen-mile and Eight-mile claims, then across the Tumut by way of New Meragle, and thence in the direction of Batlow.

These basalt flows are further interesting by reason of the comparisons which may be instituted by a study of them between present and late tertiary topographical conditions.

(1.) From the Nine Mile to the Twelve Mile, a distance of 20 miles, the Kiandra lead shows a fall of 785 feet.

This then indicates the direction of the old stream, viz., from south to north.

The present Encumbene River rises near the Six Mile, and flows thence past the Nine Mile. Thus the two streams ran in opposite directions.

The Round Mountain lead has a fall in the direction of the Fifteen Mile, Eight Mile, and New Meragle. Its course is thus fairly parallel for miles with that of the present Tumut River.

(2.) The basalt flowed along the old river-beds, thus occupying the lowest portions of the country at that period.

(3.) The Tumut has cut very deep ravines through these basalt caps and the underlying rocks.

Near the Fifteen Mile Claim the Tumut gorge is 2,500 feet deep; the basalt has been trenched across, and occupies at present the highest portion of the land in the neighbourhood.

At New Meragle wash with basaltic covering has been found near the edge of the Tumut gorge and 2,200 feet above the stream, while the Tumut River at its junction with the Yarrangobilly is 3,600 feet below the basalt cap forming its eastern bank.

From (2.) and (3.) we see how potent have been the forces of erosion since the basalt outburst; for since the deep leads represent the lowest levels reached in Tertiary times, and seeing that the basalt occupied these lowest sites, and also that the present rivers have cut their way through the basalt cappings, it is clear that all gorges in the locality below these old levels must post date the period of basaltic eruption.

(4.) The leads show a great quantity of alluvial deposits, amounting to a thickness of 150 feet and a width exceeding 10 chains, while the present river beds of the locality are small and rapid with scanty deposits of wash.

In the neighbourhood of the Nine Mile even to day the leads are separated by a ridge of rock much more elevated even than the Nine Mile claim. Taking into consideration the enormous amount of denudation effected since the existence of the leads as water systems, the great quantities of gravel and lignite contained in the leads themselves, it is only natural to surmise that a little while before the basaltic outbursts two large streams flowed in the neighbourhood of Kiandra, one in a northerly, the other in a north-westerly direction; that they were separated in the vicinity of Kiandra and the Nine Mile by a high ridge; that they have their sources in the mountains to the south, which were much more conspicuous than at present, besides being perennially snow-capped during a certain period, and that at various stages of the river history the vegetation along the banks formed growths comparable in luxuriance with those seen in the "brushes" of the present coastal areas.

METEOROLOGY.

Kiandra district has no well-defined seasons. The summer weather is generally mild and pleasant, but heavy frosts and snowstorms have been recorded in December and January. One storm is mentioned during which



KIANDRA TOWNSHIP AND EUCUMBENE RIVER.

3 feet of snow fell on the 26th December. The average annual temperature is 44·5 degrees, the maximum officially recorded shade temperature is 85°, and the minimum—20° (52 degrees of frost) in August, 1882.

The rainfall is 63·78 inches per annum, and the town, in severe winters, is almost buried beneath snowdrifts.

The prevailing wind is from the north-west.

VEGETATION.

The mountain ash attains a prodigious height in the deep gullies. At the bases of these gorges messmate and white gum abound.

The hardy snowgum is the only timber that can withstand the wind and snow in exposed situations at altitudes exceeding 5,000 feet. On the windward sides of the hills these trees have a regular network of branches, twisted into all manners of curves, and possessed of exceeding toughness so as to withstand the great snow pressures they are subjected to. In these shelterless spots also the snow timber permanently leans to the south-east, owing to the force of the prevalent north-west wind.

At altitudes exceeding 6,000 feet no trees will grow.

Heaths, peaty growths, and stunted vegetation are exceedingly common. On the gathering grounds of the streams a curious phenomenon occurs, the surface over large areas appearing as if stripped in places for turf-getting. These bare patches are always narrow as compared with their length, being bluntly crescentic in shape. A frequent width is 2 feet with a length of 10 feet. They occur as depressions, some 6 to 8 inches in depth, and are almost equal in total area to their well-grassed surroundings. They are always arranged normally to the direction of flow of the water, and occur only on spots with little or no fall. The ground around is remarkably well grassed, being quite springy when walked upon.

They form a most instructive lesson in the compromises effected between animate and inanimate forces in the adjustments of their respective boundaries.

At the points on the hillsides where the water issues from beneath the basalt capping thick spongy masses of vegetation collect, sometimes as much as 3 and 4 feet in thickness.

GEOLOGY.

1. GENERAL GEOLOGY OF DISTRICT.

The geological formations in the vicinity of Kiandra are extremely interesting, consisting as they do of well-marked claystones, breccias, conglomerates, sandstones, quartzites, shales, fossiliferous limestones, hard siliceous and soft fissile slates, tuffs, and felsites (?) intruded by sills of syenitic-diorite, norite bosses, basic andesites, quartz-felspar porphyries, gneisses, and granites.

Of the rocks observed, the oldest occur in the neighbourhood of Lobb's Hole Copper-mines, and consist of siliceous claystones, breccias, conglomerates, sandstones, and quartzites. These, the lowest members of the series, are in the main suggestive of very shallow marine conditions. The finer-grained sandstones and the quartzites further emphasise this point by reason of well-preserved ripple marks and annelid (?) tracks found in them.

The upper 100 feet of these rocks, by reason of superior hardness, outcrop boldly on the hillsides (Plate III), sweeping up or down the ravine slopes according to the prevailing dip. These constitute such a marked feature in the landscape as to be known as "The Walls."

Above these large lenticular patches of limestone were laid down, containing abundant fossil remains.

To these succeeded great masses of shales and slates, indicative of deeper sea conditions.

These in turn gave place to great accumulations of fine and coarse tuffs of an andesitic character. Rocks here occur possessing markings similar to the flow-contortion structure seen in many felsites, as well as small bands of tuffaceous slates.

Slates and sandstones, since silicified in great measure to quartzites, mark a still later period of sedimentation.

The younger members of the series, *e.g.*, the tuffs, quartzites, and slates, appear to have been intruded by rocks showing affinities with both quartz-syenites and quartz-diorites in the form of a large sill with smaller attendant dykes.

In Racecourse Creek another type of rock, possibly also a syenite, occurs in the form of bosses and sills. This, as also the syenitic-diorite, appears to have partaken in all the dynamic metamorphism of the district.

Several basic andesite dykes occur in the neighbourhood of the dioritic rock, and are doubtless associated with it. These rocks are also extremely altered.

Small norite bosses appear to have made their appearance next.

Equally small granite bosses occur, which weather out into very similar forms. Both are scattered capriciously over the field, and appear to be closely associated with each other, and probably do not differ much in age.

In Carboniferous (?) times the great districtal disturbance took place in the form of huge granitic and gneissic intrusions. This is the age of so much of the granite and granitite of Eastern Australia.

Most probably the whole of the Upper Silurian strata of the district was influenced by earth movements, and became possessed of a fairly high angle of dip at a period ante-dating the granitic intrusions. These latter, however, were on a magnificent scale, and there is little doubt that in the Kiandra district the crumpling of the rocks observable along the Yarrangobilly River was determined mostly under the influences of these acid bosses.

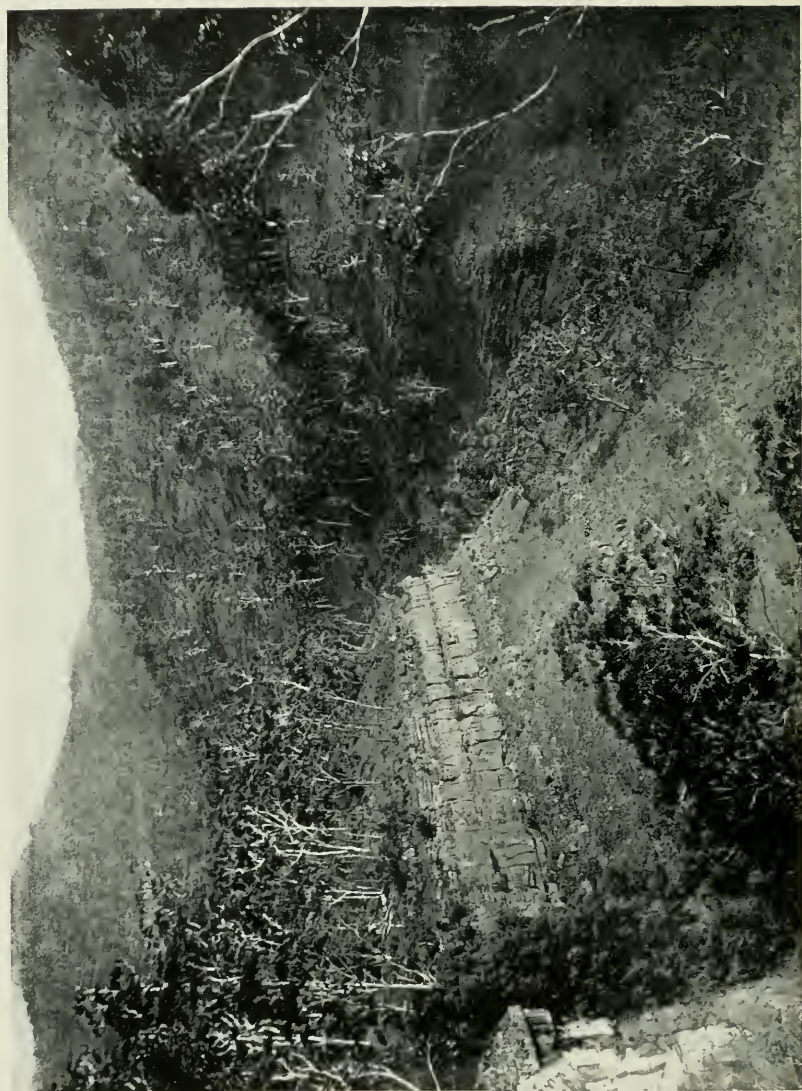
After the close of the Palæozoic period geological influences were mostly confined to the work of disintegration and erosion. The mountains were planed down, the granite massifs which had cooled at great depths were bared, and themselves fashioned into high peaks.

In middle and late Tertiary times the rivers of the district were larger and flowed in the opposite direction to the present course of the Eucumbene River.

A long period appears to have been occupied in the formation of huge deposits of river material. Subsequently different climatic conditions obtained. Luxuriant growths of vegetation, attended doubtless by much milder temperatures and abundant rainfalls, clothed the banks of the ancient rivers. These formed the thick masses of carbonaceous material which form such a prominent feature of the "lead" sections.

After the deposition of the lignite, sand, clay, and fine river-wash were deposited in thin beds, to be followed by other beds of lignite.

After several alternations of stony and carbonaceous layers, a great basaltic outburst took place, probably in late Tertiary times. From different centres, such as Table Top Mountain, Round Mountain, Pig Gully Hill, &c., basalt was poured out in great streams, filling up the old river-beds for many miles. The diverting of the streams into other channels by this volcanic display has been discussed under the head of physiography, as also the probable amount of material removed by atmospheric agencies since that time.



"THE WALLS," LOBB'S HOLE.

2. SEDIMENTARY ROCKS.

(a.) Recent and Pleistocene—Shallow alluvial deposits—Calcareous deposits in watercourses.

To those belong the present shallow "placers" of the district, and the masses of travertine encrusting the strata underlying the bedded limestone at Lobb's Hole.

At this locality a large mass of limestone occurs, immediately overlying the hard quartzite formation known as "The Walls." These occur as almost sheer faces, varying in height from 40 to 250 feet. Near the Copper Mines masses of travertine encrust "The Walls" at the heads of the gullies, and have in one or two cases the appearance of limestone inliers. Their origin is instructive. On the top of "The Walls" a species of tea-tree scrub flourishes in the soft tufa brought down the watercourses. Alongside of these also thick masses of mossy growths flourish in the tufa. The calcareous material is deposited on these vegetable growths, and quickly covers them up, but the lowly vegetation grows upward and outward, so that as the lower portions are wholly enclosed by the tufa the upper part is still vigorous. Thus the secondary calcareous material has a tendency to advance in an upward and outward direction. The tea-tree masses also flourish on the perpendicular face of the tufa, and are being continually buried in the calcareous mass. The tufa thus formed is extremely light and porous, but as the mass thickens the vegetable constituent perishes, and percolating waters consolidate the whole into compact limestone and calcite. In one place this secondary growth has advanced fully 70 to 100 feet in front of the quartzite precipice, and is itself a precipice fully 100 feet high and 200 feet in width. The old part in contact with the base is of calcite, eaten into large caverns containing many beautiful stalactitic growths, while the perpendicular face of the travertine or tufa is covered with tea-tree and mossy mass. All the tea-tree branches and roots have a thick coating of tufa.

*(b.) Tertiary.**The Kiandra Lead—The Round Mountain Lead.*

The Kiandra Lead.—The deposits occurring in this lead consist of the following, with local modifications:—

1. Auriferous wash.
2. Sand and clay.
3. Iron pyrites.
4. Earthy lignite.
5. Clay and sand.
6. Earthy lignite.
7. Sand and clay.
8. Earthy lignite.

The total thickness of the beds is about 150 feet. Abundant traces of leaves are contained in the layers of lignite. Perfect specimens are rarely procured, owing to the softness of the matrix.

The Round Mountain Lead.—The succession of beds here has been discussed elsewhere in the report, as also the occurrence of leaves in an excellent state of preservation.

C.—*Upper Silurian (?)*.

The strata of this Palæozoic age fall naturally into five divisions:—

(1.) A lower series, consisting of claystones, breccias, conglomerates, sandstones, and quartzites, the upper beds of which form "The Walls." (Plate III.)

Of these, the breccias and conglomerates deserve special mention. They are lenticular in character, attaining enormous local developments. At the Copper-mines the breccia forms a thin sheet, containing angular fragments of quartzite about the size of a walnut. A mile to the east it makes into a much thicker bed, the dip of which corresponds with that of the mountain it constitutes in part. The quartzite fragments are large, varying from 6 to 18 inches in diameter, and are set in an impure quartzite cement. This cement weathers more rapidly than the enclosed fragments, and the weathered surface of the breccia then has the appearance of a rough talus slope. The fragments, however, when struck with a hammer, are found to be *in situ*.

The conglomerates and grits are closely connected with the breccias, and form in the Yarrangobilly River cañon cliffs as much as 100 feet in height. The bulk of the strata is composed of well-rounded quartz pebbles, set in an insignificant amount of cementing sandstone. The pebbles vary in diameter from 1 to 12 inches. They rest on fissile slates and quartzites.

The overlying sandstones are indurated, and the quartzites very fine in texture.

(2.) *The limestones* are lenticular in character. Two deposits occur, one at Yarrangobilly, the other at Lobb's Hole. Their periods of deposition are probably not far removed, although the folding to which the country has been subjected would necessitate detailed examination to decide this point. The principal difficulty lies in the great variations in the dips, and the very local development of rock characteristics, conglomerates giving place to sandstones and slates within very short distances.

The following fossils, obtained from the Lobb's Hole limestone, have been identified by Mr. W. S. Dun, Palæontologist to the Survey:—

- Spirifera Yassensis. *De Koninck* (abundant).
- „ multiplicatus. „
- Pentamerus Knightii. *Sowerby*.
- Rhynchonella (Uncinulus) Wilsoni. *Sowerby*.
- Chonetes striatella. *Dalman*.
- Athyris, or Meristella.
- Modiomorpha (?).
- Fragment of a rugose coral, Amplexus (?).
- Orthoceras.

Mr. Etheridge has also determined from these beds—

- Spirifera latisinuatus. *De Kon*.
- Rhynchonella euboides. *Sowerby*.

The latter most probably is the form listed above as *R. Wilsoni*.

A species of *Paraocyclus* has also been collected from these beds by Mr. Warden Love.

At Yarrangobilly the predominant brachiopod is *Pentamerus Knightii*, represented at Lobb's Hole by a single fragment.

Associated with *Pentamerus Knightii* in these beds are found (as determined by Mr. Etheridge in 1894)—

- Bellerophon (two species).
- Euomphalus, or Oriostoma.
- Ptycomphalina.
- Cyclonema.
- Murchisonia (Hormotoma, or Cælocaulus).
- Pleurotomaria (Mourlonia, or Ptycomphalina).
- Orthodesma (?), and a large indeterminable bivalve.

(3.) The slates have a higher and more uniform dip than the lower conglomerates and breccias. They are very fissile, "creeping" structure is of common occurrence; decomposition has set in, turning the slates to a green colour, and silicification is very pronounced.

Most of the reefs occur in these strata. The prevailing strike is N. 15° E.

(4.) *The Tufts.*—These form the majority of the rocks about Kiandra township. They occur as bands of coarse green rocks alternating with fine-grained grey varieties having a felsitic appearance. Although conforming in the main to the strike of the country, they present decided local variations, the strike of the beds in these cases being at times at right angles to the prevailing trend of the country. The tufts at times are so compact as to be almost indistinguishable from igneous rocks. They have been classed hitherto as diorites. In the finer-grained varieties the fissile structure so pronounced in slates are characteristically absent.

(5.) The quartzites and siliceous slates to the east of the tufts possess the same general strike as the fissile slates to the west. They are extensively developed about Sawyer's and Governor's Hills. No traces of fossils have been discovered.

C.—Eruptive Rocks.

1. *The Syenitic-diorites.*—These occur mostly in the form of a huge dyke or sill, more than 6 miles in length, and conforming generally to the strike of the associated slates and tufts. The map shows its approximate boundaries only. In several places it is reduced to two or three narrow dykes, while at the Eucumbene River and at the Four-mile Creek it broadens considerably. Its probable north and south extensions beyond the limits shown on the accompanying map were not followed.

The rock weathers out into ragged forms, and not after the typical manner of coarsely-grained plutonic rocks. Its age appears to considerably ante date all other intrusive igneous rocks of the locality. The component minerals have been much decomposed; the forces of dynamic metamorphism are very evident, and slickensided epidote is a common constituent.

Numerous syenitic dykes attend the main line, especially on Sawyer's Hill, near the intersection of the Cooma-Kiandra road with the Eucumbene River.

Several very basic andesitic dykes appear to be associated with this syenitic rock. They are composed of uralitised augite phenocrysts set in a fine matrix. They appear to have been much altered.

2. *The Norites.*—These occur as very small rounded bosses, weathering out into large spheroidal blocks, after the manner of coarse varieties of plutonic rocks. The largest exposure occurs at Kiandra township itself, and is from 15 to 20 acres in extent. A few blocks occur at the head of Whipstick Gully. A small patch near Charcoal Reef is associated with a small biotite granite boss. An outcrop, about 1½ acres in extent, occurs at the Eucumbene River below the basalt claim; and another in the Four-mile Creek.

At Kiandra the rock is basic, and exceedingly tough in character, by reason of the great amount of contained hypersthene.

Curious structures are noticeable in the mass, thin layers of varying basicity occurring in some of the blocks, giving the appearance somewhat of stratification.

The occurrence of small bosses scattered capriciously over the field points probably to the existence of a much more extensive mass below. The dykes associated with these bosses also weather out in spheroidal blocks.

These rocks do not appear to have suffered nearly so much from the agencies of metamorphism as the older syenitic rocks.

Gneisses and Granites.—The acid plutonic rocks of the district probably belong to the Carboniferous Period.

At New Meragle biotite granite possesses a decidedly banded structure. This rock has a fresh appearance.

At Rocky Plain, Governor's Hill, Alpine Hill, and Table Top Mountain a ternary granite occurs. The constituent minerals do not appear to have suffered much from metamorphic influences.

These acid rocks have a very extensive development, and their intrusions appear to have caused the pronounced crumpling in the local strata.

In the tuffs and slates very small granite bosses occur, one behind the Cemetery Reserve, one at Pig Gully, and one at Charcoal Reef, closely associated with a norite boss.

Quartz-felspar porphyries.—Irregular masses and dykes of acid porphyry occur in the district, and may be connected with the granite of Rocky Plain, although they have not been traced into any boss. They are decidedly younger than most of the igneous rocks of the locality, cutting across the line of strike of the syenitic rocks and the basic-andesitic dykes.

The Basalts.—These are of basic types, containing abundant olivine crystals. They occur as extensive sheets overlying Tertiary river deposits.

Several local eminences, having the shape of truncated cones, and composed in their upper portions of basalt, have suggested the probability of their being volcanic foci at one time. These points are known as Table Top Mountain, Round Mountain, and Selwyn Trigonometrical Station.

Table Top Mountain is 5,850 feet above sea-level, and is composed of tuffs (Silurian), slates, quartzites, and granites, having a thin capping of basalt, about 200 feet in thickness. The basalt on the eminence is at present isolated, and at its base between 200 and 200 feet above the Nine-mile Lead. Numerous inclusions of plutonic rocks, allied to syenites, occur in the basalt. A careful search was made for signs of volcanic eruption, such as tuffs or scoriæ; none were found. Mr. L. H. G. Young, formerly Geological Surveyor in the Department of Mines, mentions the occurrence of a solitary fragment of volcanic breccia* on the hill summit. It is very probable that this elevation formed one of a group of centres from which basalt was poured forth over the "leads."

Selwyn Trigonometrical Station is of similar formation to Table Top, consisting of Palæozoic tuffaceous rocks with a very thin capping of heavy olivine basalt. The basalt of the hill and in its near neighbourhood exerts a decided influence on the compass. Thus on one side of the trigonometrical station the deflection was 15 degrees; on another side it amounted to 35 degrees; while 1,000 yards away, on basalt of similar appearance, the deflection was as much as 65 degrees.

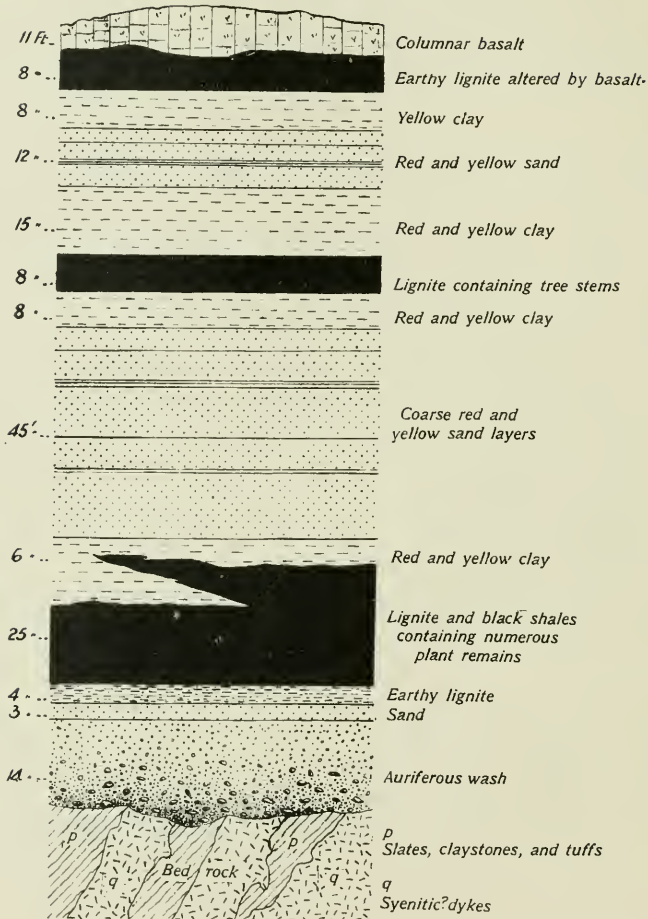
THE LEADS (1).

These are two in number, and may be called "The Kiandra Lead" and "The Round Mountain Lead." In both instances they lie beneath wide basalt flows, and the record of them is preserved only as the basaltic cap resisted the encroachments of the weather. The basalt itself, in the first instance, was determined in its main features by the course of the old rivers now constituting the channels of the present leads. The streams being diverted from their courses, cut for themselves other and lower channels, and have since been attacking the basalt mass. This from its superior hardness has resisted the various attacks made on it, while deep cañons

* Ann. Rept. Dept. Mines for 1880, p. 251.

Section of Working Face . New Chum Hill

PATTINSON AND WINCKLER'S CLAIM



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Sydney, N.S.W.

have been carved out in the softer contiguous strata. But even the dense basalt has yielded in great measure to the stress laid upon it, partly by the action of severe frosts, and partly by percolating and eroding waters, until, as will be seen by glancing at the accompanying map, at least one-half of it has vanished, superficially considered.

When the basalt covering in part was removed, the soft underlying alluvium was quickly washed away.

The gold contained in the old channel would, however, remain for a still greater length of time, and while the wash itself disappeared, much of the gold would remain in more modern and neighbouring watercourses, although at lower levels than the parent channel.

Both of the deep leads have been proved over great distances.

THE KIANDRA LEAD.

1. *Extent.*

Near Table Top Mountain the Kiandra lead has been proved by the excavations known as the Empress sluicing claim.

Here beds of lignite, clay, sand, and wash exist, having a total thickness of 160 feet. (*See Diagram .*)

From 10 to 15 chains beyond the "Empress" to the north a series of shallow shafts have been sunk in river drift similar to that occurring in the upper portions of the Empress.

Two miles to the north of the Empress, and under the same line of basalt, the South Bloomfield sluicing claim exposes another section of the old drift. Thence northwards the basalt has been worn away for a distance of nearly 2 miles.

At the point where the basalt makes again abundant evidence of the lead is present on the hill slope under the lava sheet in the form of wash, clay, and lignite, similar to that shown in the Empress and South Bloomfield claims.

Following the line of basalt known as Township Hill, various signs of the lead are apparent as one nears the northern portion of the hill.

In Pollock's Gully a shaft has been sunk through lignite and clay; two tunnels at the northern point of the hill have been driven through lignite and wash.

Lignite occurs also on the north-west portion of the hill, and close to the south-west corner of G.L. 60 a shaft 75 feet deep has been sunk through lignite and wash.

At the northern extremity of the hill, Bullock Head Creek has cut through the basalt, which latter is met with again on the southern portion of New Chum Hill.

Here for 40 chains along the southern boundary of the hill the various hydraulic sluicing claims known as Pattinson and Winckler's, the Cornishmen's, and Homeward Bound Claims demonstrate the presence of abundant drift underlying the basalt cap. (*Frontispiece.*)

Northerly, further evidence of the lead is present on the hillsides near the Giandarra, Luttrell's, and All Nations Claims. These also, consisting of tunnels and open cuts, have all proved the presence of wash and lignite similar to that obtained in the various sluicing claims already enumerated.

At this point a gap occurs in the basalt line, due to the erosive action of the Six Mile and Racecourse Creeks, the lava reappearing to the north at the Six Mile workings.

Similar wash to that found at New Chum and Township Hills is here exposed on the hillside beneath the basalt.

On the main Tumut Road river sand is exposed on the roadside at the 50½-mile post, and underlying the basalt.

Further north again, at the Twelve Mile, and at a point where the Murrumbidgee River has cut across the basalt, Luttrell's tunnels have proved the existence of well-rounded wash beneath the basalt.

Wash has also been reported beneath the basalt from various places north and south of the above limits, *e.g.*, at a spot several miles to the south of Table Top Mountain and a locality some 20 miles north of the Twelve Mile.

2. *Argument in favour of lead instead of lake formation.*

The existence of a lead at Kiandra has been denied by many. The contention is that similar wash occurs at the Fifteen Mile, the slopes of the Tumut River, the Eight Mile, New Meragle, and other places; that the latter are altogether off the line of the supposed Kiandra Lead; and that the evidence is rather in favour of a large lake formerly stretching across Monaro, and embracing the country from Happy Jack, Tumberumba, and Broken Cart.

If a lake, the bed should not be altogether confined throughout its length between narrow walls; and the drift should not be of an even thickness throughout, but should form overlapping masses of water-worn material thicker in places than others.

On the other hand, if the wash can be shown to be confined to a long narrow channel, the levels of the bed-rock under the wash to be possessed of a continuous rise or fall as one passes the various claims in any given direction of length, and the wash to be evenly distributed along its length, then the evidence in favour of an old river-bed is undeniable.

(a) Evidence derived from study of the old channel banks.

At the Empress Claim (Nine Mile) bed-rock occurs to the north-west, rising above the base of the wash to a height of 50 feet. Ten or fifteen chains to the north the older rock is 150 feet higher than the lowest portion of the drift, and shuts the old channel off to the east under the basalt.

To the east again, and at a distance of some 40 or 50 chains, the bed-rock may be traced for a considerable distance beneath the basalt, and rising high above the level of the wash.

In the immediate vicinity of Table Top Mountain the wash has been removed by atmospheric agencies; but here, also, it was extremely narrow, for the high ridge of rocks forming the main Snowy Range confines it to the east, while to the immediate west the country rock is considerably higher than the old channel level.

At the South Bloomfield the wash is surrounded on three sides by high ridges of rhyolites and tuffs, the old channel being open towards the basalt only on the south-west.

At the North Bloomfield the original channel is well exposed; but, to the west, there is no sign of it, the place being occupied by rhyolite tuffs and slates much higher than the wash level. These tuffs and slates may be traced beneath the basalt on the west side of Township Hill, signs of the old channel becoming abundant only near the northern point of the hill at G.L. 60.

Similarly the channel is enclosed to the east of the same hill, the bed-rock outcropping beneath the basalt at heights considerably above the base of the wash. At Basalt Claim signs of wash are frequent. Here it is again confined (*see* Diagram), and from a consideration of the distribution of the basalt probably belongs to a tributary of the main stream.

Behind the Cemetery Reserve, in Commissioner's Gully, and on a large spur enclosing Pollock's Gully to the south, the enclosing of the old channel is specially well marked.

The spur just mentioned, composed of felsites and tuffs, rises some 300 feet above the wash, and stretches for over half a mile into the valley below, forming a huge buttress to the basalt-capped hill.

Immediately behind this shoulder of bed-rock, lignite and clay crop out in Pollock's Gully. As these are, however, 150 feet above the base of the wash in Township Hill Tunnel, 50 chains away, they probably represent the upper layers of the made ground. Here, also, immediately to the east of the shaft, the bed-rock outcrops some 120 or 130 feet above the wash level.

Thence to Township Hill Tunnel the bed-rock is from 70 to 100 feet above the auriferous wash, with, possibly, a slight outletting of the channel in the vicinity of Wesselman's Tunnel.

At the north-east corner of Township Hill the channel appears to be exposed in a natural section. Here pebbles, sandy wash, clay, and lignite over 100 feet in thickness outcrop on the hillside. (Plate VI.)

Across Bullock Head Creek the wash is well exposed on the southern end of New Chum Hill. By sluicing and tunnelling the channel has here been proved to have (over a distance of 40 chains) a narrow course rarely exceeding 10 chains in width, and confined on both sides by banks of tuffs and tuffaceous slates, and to have a westerly course.

Thence towards the northern point of New Chum Hill the channel appears almost totally confined beneath the basalt capping of the hill.

In Garden Gully, on its southern side, the bed-rock rises 100 feet and over above the level of the wash in the various claims just named. On the north side of the gully the basalt talus is excessively thick, concealing all traces of the underlying rocks.

A high spur of slates encloses Garden Gully to the north-east, shutting the channel off on the east. Immediately to the north of the spur signs of wash are abundant on the hillside beneath the basalt.

Here also the Giandarra and Robyn's Tunnels, Luttrell's and All Nations' Claims have proved the channel over a considerable distance, though they have not settled beyond doubt the width of the wash.

Near the All Nations' Claim the channel has been cut across by later streams.

Some 10 chains to the west the bed-rock (an igneous variety) rises 100 feet above the wash, and forms the western channel bank.

Thence for several miles to the west and south, following the basalt along New Chum Hill, the bed-rock can be traced at a much higher level than the wash.

At Reid's Gap the slates are 150 feet higher than the channel bed.

From All Nations' Claim to the north both basalt and wash have been removed by the forces of erosion over a distance exceeding 2 miles.

At the Six Mile workings the basalt is picked up again, and with it the auriferous wash, its cappings of lignite, clay, and sand. Here, again, as at New Chum Township and Nine Mile Hills, the channel is confined between high eastern and western banks of rock for miles, by way of Gooandra Trigonometrical Station.

On the main Kiandra-Tumut road, 10 chains north of the 50-mile peg, much sandy river material is exposed beneath the basalt in the road cuttings, and enclosed on both sides by slaty rocks.

At Lander's old tunnel, about a mile west of Tantangara Creek, the wash has again been proved, though its exact width has not been ascertained;

also in two other tunnels driven by the same person, one about 10 chains from the Murrumbidgee River, the other at a spot where the Murrumbidgee has cut through the basalt cap.

The various points just enumerated, at which the old channel has been confined within narrow banks, are all indicated on the accompanying map.

(b) Evidence from character of the wash.

Wherever exposed, as at the Six Mile, New Chum, Township, and Nine Mile Hills, the drift has a fairly uniform character and thickness (*see* sketch sections across the various claims).

More or less auriferous wash is always overlain by layers of earthy lignite, clay (with thin bands of ironstone at the Four Mile and Nine Mile Claims), and sand layers, and the amount of made ground is almost without exception from 150 to 170 feet in thickness.

(c) The evidence of the levels.

Levels were run with a dumpy from the Six Mile to the Bloomfields. The heights of outlying points, such as the Nine Mile and Twelve Mile workings, were ascertained by means of an aneroid.

Starting with the lowest wash observed in the Old Six Mile workings as a bench-mark, and passing each claim in succession southwards to the North Bloomfield, the levels obtained are as follows:—

	Feet.
1. Six Mile workings (lowest portion of wash seen)	0'000
2. Giandarra Tunnel mouth (nearly on same level as wash) ...	9'770
3. Pattinson & Winckler's Sluicing Claim (base of wash) ...	31'980
4. Homeward Bound Claim (base of wash)	32'548
5. Township Hill Tunnel mouth (approx. same level as wash)	58'085
6. North Bloomfield (base of exposed wash)	309'525

Combining aneroid and dumpy level readings, commencing with the wash at the Twelve-Mile as a base, we have the following:—

	Feet.
1. Twelve Mile (Lander's claim)	0'000
2. Six Mile workings	226'915
3. Giandarra Tunnel mouth	236'685
4. Pattinson & Winckler's Claim	258'895
5. Homeward Bound Claim	259'463
6. Township Hill Tunnel mouth	285'000
7. North Bloomfield	536'440
8. South Bloomfield	641'440
9. Empress Claim (Nine Mile)	785'000

There is thus a fall of 785 feet from the Empress Claim to the spot where the Murrumbidgee River cuts through the basalt at the Twelve Mile, a distance, measured along the road, of 20 miles.

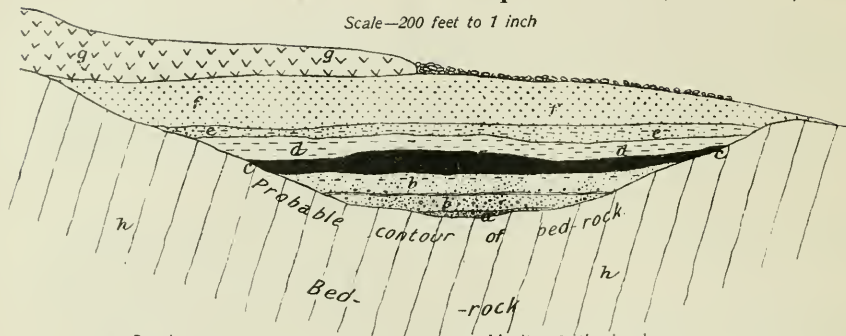
By dumpy level the difference between the Giandarra and Homeward Bound Claims, is 22,750 feet.

There is thus very little fall in the New Chum Hill wash, although large potholes occur in the old river channel.

From the North Bloomfield to the Township Hill Tunnel mouth a fall of 251,440 feet was measured. As the Basalt Claim wash, 2 miles to the south, is very little higher than the entrance to this tunnel (25 or 30 feet),

Sketch Section across The Empress Claim (Nine-mile)

Scale—200 feet to 1 inch

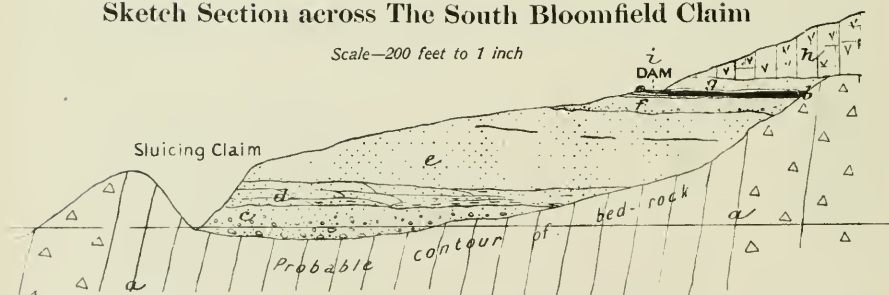


- | | |
|------------------------|--|
| g Basalt | c Lignite—earthy in places |
| f Sand and fine gravel | b Gravel, sand, clay, and ironstone layers |
| e Pipeclay and sand | a Payable wash |
| d Stiff clay | h Tuffs, slates, and quartzites |

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Sketch Section across The South Bloomfield Claim

Scale—200 feet to 1 inch



- | | |
|---|--|
| h Columnar basalt | f Sub-angular gravel |
| g Sand | e Sand, probably containing lignite layer |
| b Lignite | d Sand and clay showing current bedding, 30 feet |
| i Dam in lignite, 145 feet above base of wash | c Wash and sandy gravel, 25 feet |
| | a Tuffs |

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The wash is enclosed to the east, north, and west by bed rock (tuffs), rising to a considerable height above it.

To the north-west the tuffs are 175 feet higher than the wash.

the bed of the channel should be fairly flat over a considerable distance to the south, but thence to the North Bloomfield a sharp rise may be expected to occur.

From a consideration of the foregoing it will be seen that from the Twelve to the Nine Mile, a distance of 20 miles, the channel has been proved to be very confined, very rarely exceeding 10 chains in width, and possessing a more or less auriferous wash some 50 yards in width; that it has a meandering course; that the old drift is very similar in geological character throughout, consisting of auriferous wash (of varying value), earthy lignite, sand and clay layers with an uniform thickness of 150 to 170 feet; and that a constantly decreasing level exists between the claims of the Nine and Twelve Miles.

It thus fulfils all the conditions required for it as a river, while the conditions are altogether opposed to those obtaining in a typical lake.

Description of Claims, and Auriferous Contents of the Lead.

(a.) The Empress Claim and Neighbourhood.

Very rich waterworn gold was found in Scott's Gully, and by working up this watercourse, the gold was traced into the old drift underlying the basalt.

At this point the lead was found to be exposed in natural section on the hillside.

From the sluicing claim started at this point and named the Empress, considerable quantities of gold have been obtained similar in character to that obtained in Scott's Gully surfacings.

In the sluicing claim the whole of the wash was taken, no distinction being made between the rich auriferous channel and the poorer and higher contiguous wash.

A rough estimate made by Mr. J. M. Lette, (the proprietor) of the ground treated by hydraulic sluicing, together with a larger area adjoining it and treated by surface sluicing amounted to 60,000 yards, yielding £1 per yard.

Certain yields from sluicing operations at the Empress Claim during the years 1884-1889, and supplied by Mr. J. Pattinson, senr., from the Company's books, amount to 3,400 yards, sluiced for a yield of 496½ oz. gold.

On the suspension of sluicing operations (owing to the difficulty of removing the "overburden" of basalt, &c.) a main tunnel was driven in about 2,000 feet, and from 30 to 33 feet below the lowest wash exposed in the sluicing claim.

An upper tunnel was driven through the wash, keeping as nearly as possible to the centre of the auriferous channel.

Cross drives have been put in on each side of this upper tunnel for about 50 to 75 feet to prove the wash.

"In all about 1,000 feet along the channel are now ready for blocking out, which should yield 12,000 superficial yards of wash averaging ¼ dwt. to the yard." (Mr. J. M. Lette, Proprietor.)

Two dishes of dirt taken from the centre of this area, and washed in my presence, yielded about 3½ grains of gold.

In the Nine Mile Creek, wonderful yields of waterworn gold were obtained in the early days of the field, and, as in the case of Scott's Gully, the gold has been traced up the watercourse to a point where it disappears under the basalt.

The amount of gold won in Scott's Gully and Nine Mile Creek cannot even be approximately arrived at, owing to the non-existence of records of gold yields, but from all accounts it was very great.

(b.) The South Bloomfield.

This claim (sluicing) never yielded gold to any extent, but it must be remembered that the prospectors have here only touched the wash, and do not appear to have gone nearly deep enough to prove the lowest portions.

This will be evident from a glance at the accompanying sketch section.

Here it will be seen that the excavation is mostly in bed-rock and the channel dips away from the open cut into the hill.

The Four Mile Creek, in the break between the North and South Bloomfields has yielded great quantities of coarse gold, said to be indistinguishable in character from the gold of the lead.

All along the course of this creek, between the limits just mentioned, large angular and subangular fragments of quartzite occur similar to those seen at the Nine Mile and covered partly by the basalt.

It is very probable that these quartzite masses represent conglomerates or the upper wash of the lead, altered to quartzites by the heating action of the basalt, and have remained owing to their hardness, while the softer parts of the wash have been removed after the denudation of the basalt cap, and that the gold present in the creek also represents, in great part, that which was originally contained in the lead, although the bed of the lead was some 200 feet higher than the level of the present stream.

(c.) The North Bloomfield.

This claim like the South Bloomfield was taken up as a sluicing area. A deep tail-race was cut and an excavation made in the hillside some 5 chains long, $1\frac{1}{2}$ to 2 chains in maximum width, and 50 feet deep.

This claim has not produced much gold, but the remarks made concerning the South Bloomfield are applicable here also. It is almost certain that the deepest ground has not been touched. (See diagram .)

At this point and for some distance southwards the lead appears to be confined beneath the basalt and does not show on the side of the hill.

(d.) Basalt Claim and Tunnel.

These claims occur on a steep spur of Township Hill overlooking the Eucumbene River near its confluence with the Four Mile Creek.

Basalt Claim was taken up as a sluicing area. Very little work was done and the returns were poor. The hill, at this point, cannot be said to have been properly tested.

The diagram represents a sketch section based on measurements obtained at this claim.

Basalt Tunnel is a little more than 40 chains north of the latter claim, and consists of a tunnel driven some 300 or 400 ft. into the hill beneath the basalt. Well rounded quartz wash was obtained from the tunnel. The channel was auriferous, but was never properly tested.

The wash, lignite, and sand amount to fully 120 feet as determined by aneroid readings.

A section through this claim would be very similar to those obtained at the North and South Bloomfields.

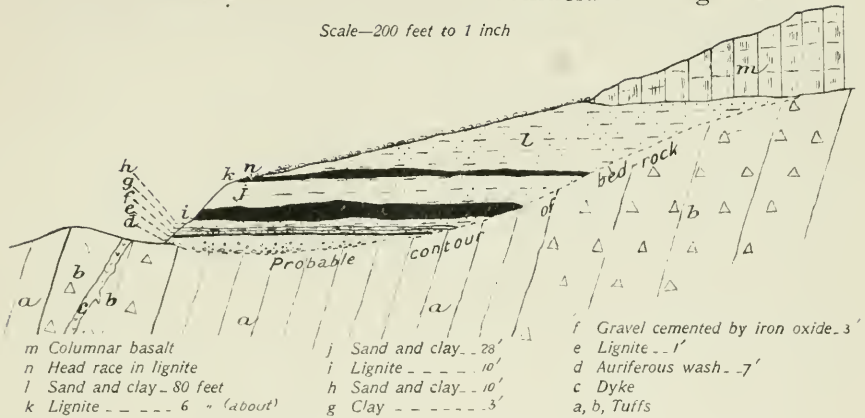
Gold was obtained in the small gully leading from the tunnel to the Eucumbene River.

(e.) The northern portion of Township Hill.

In Pollock's Gully, at the township of Kiandra itself, wonderful gold yields were obtained. The gold was said to be partly waterworn and partly ragged, like that found in the lead itself.

Sketch Section across The North Bloomfield Sluicing Claim

Scale—200 feet to 1 inch



- m Columnar basalt
- n Head race in lignite
- l Sand and clay—80 feet
- k Lignite—6—(about)

- j Sand and clay—28'
- i Lignite—10'
- h Sand and clay—10'
- g Clay—3'

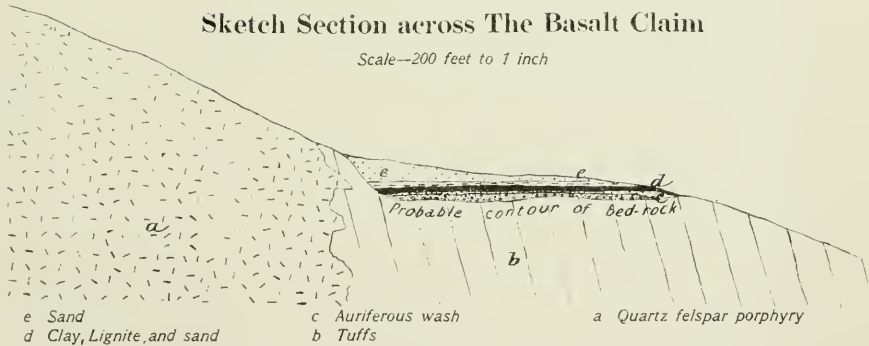
- f Gravel cemented by iron oxide—3'
- e Lignite—1'
- d Auriferous wash—7'
- c Dyke
- a, b, Tuffs

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The slope of the working face is shown in the sketch, and the lowest part of the auriferous wash has evidently not been exposed.

Sketch Section across The Basalt Claim

Scale—200 feet to 1 inch



- e Sand
- d Clay, Lignite, and sand

- c Auriferous wash
- b Tuffs

- a Quartz felspar porphyry

Forty chains to the north, the river gravel and lignite are together 120 feet thick, overlaid by basalt.

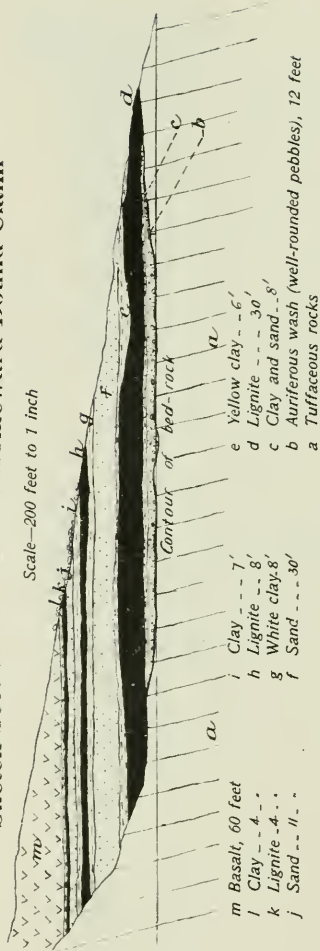
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HOMeward BOUND OPEN CUT.

Sketch Section across The Homeward Bound Claim

Scale—200 feet to 1 inch



01375

Photo-lithographed by
W. A. Gulick, Government Printer,
Sjdney, N.S.W.

The rich prospects ceased in the vicinity of Wesselman's Tunnel, the upper part of the gully not containing payable gold. Although lignite and clay outcrop on the hillside much farther up the gully, it is almost certain that the lower part of the wash was never here exposed on the hillside, since bed-rock occurs to the immediate east at a height of 100 feet above the channel.

At Wesselman's Tunnel, a small break occurs in the bed-rock, and it is probable that the lead was drained of a portion of its upper contents in this locality. Bed-rock, even here, is considerably higher than the base of the wash.

This tunnel appears to be in a good position to prove the lead, and should reach it if carried on for a further distance of 300 or 400 feet.

At the north-east point of Township Hill the course of the old channel (or, at least, one of its branches) is seen. Here 100 feet of river wash, carbonaceous clay, and sand are exposed in natural section. (Plate VI.)

A small gully leads thence to the Eucumbene River, known as Whipstick. Very rich coarse waterworn and ragged gold has been traced along the whole course of the creek, to the spot where it ends in the wash of the lead.

Township Hill Tunnel was driven in here to prove the auriferous character of the wash. The lowest portion of the channel was not reached; enough was, however, tested of the drift to prove its goldbearing character.

(f) Homeward Bound, Cornishmen's, and Pattinson & Winckler's Claims.

These claims have been worked both by hydraulic sluicing and tunnelling.

Hydraulic sluicing has, in all cases, had to be dispensed with, owing to the great amount of "overburden" to be removed.

The Homeward Bound.—Surface sluicing was at first adopted. A tail-race was cut, and the edge of the lead sluiced away. A pothole was worked for years. (Pl. IV.)

The amount of gold won by hydraulic sluicing is shown by the Company's books to have been as follows:—6 acres of ground (about 29,000 yards) were treated for a yield of 5,353 oz. 8 dwt. 11 grs. Half of this had, however, been blocked out previously, and that along the richest ground, so that the above results do not represent the amount originally contained in the lead.

The Cornishmen's Claim.—This adjoins the Homeward Bound property, and is plainly a western extension of the lead exposed in the Homeward Bound workings.

As in the latter claim, the best part of the wash was blocked out previously to the introduction of hydraulic methods.

Between 3 and 4 acres were sluiced for a yield of 1,024 oz. 11 dwt. 6 grs. of gold.

Pattinson and Winckler's Claim.—As in the Homeward Bound and Cornishmen's Claims, a mass of wash, 150 feet thick, is here exposed by hydraulic sluicing (Plate V).

Tunnelling in this area has been resorted to by as many as three or four different parties. Of 8,200 superficial yards sluiced only 2,100 were solid ground. The yield from three was 587 oz. 7 dwt. 16 grs., the equivalent of £2,197 9s. 10d.

All the above yields have been taken from the various Companies' books.

From these New Chum Hill Sluicing Claims, Mr. W. H. J. Slee mentions the following returns:—

16,955 tons sluiced,	for 926 oz. in 1884.
7,075 yds. ,,	1,060 ,, 1885.*

* Ann. Rep. Dept. Mines for 1885, p. 107

(g) Robyn's Tunnel, The Giandarra, &c.

New Chum Hill has also been proved to the north by the claims known as Robyn's Tunnel, The Giandarra, Luttrell's Sluicing Claim, and the All Nations' Claim.

Robyn's Tunnel is about 787 feet in length, driven in a direction a little south of west. After driving 330 feet through altered slates, a small rise was put up and the wash reached. The surface bed of the bed rock was, however, dipping into the hill, and the lignite was inclined at an angle of 20 degrees or more.

Further driving and cross-cutting revealed the presence of a very uneven bottom to the channel. The basal rock at first rose, but afterwards sank below the floor of the tunnel.

Five hundred feet in, the wash dips below the floor, and is in this condition to the end of the tunnel.

The wash is very interesting in the Giandarra, being of decidedly black nature, owing to the colouring of the fine-grained sand between the pebbles.

Large quartz-boulders occur, some as much as 5 feet in diameter. Much of the wash is also only partly rounded.

Above the black wash a layer of iron pyrites occurs, varying from 1 to 6 inches in thickness, and on this a very soft, black, fine-grained carbonaceous clay is superimposed.

The section illustrates the confining of the channel, its uneven bed, the irregular disposition of the lignite, and the unfortunate position of the tunnel for winning the gold in the end of the workings.

The gold yields from the Giandarra, as supplied by Mr. Hetherington, of Kiandra, are as follows:—

1,000 yards extracted for a value of 11s. 6d. per yard.

The first 290 yards blocked out yielded 40 oz.*

(h) The Six Mile.

At the Six Mile Creek workings very rich yields were obtained from the shallow ground. The gold, on being followed up the creek, was traced into the lead. This latter has not been at all thoroughly prospected. A small portion of it has been sluiced. Lately a tunnel has been driven in some 500 feet to intercept the wash. The work of driving is still progressing, but the channel has not yet been reached.

THE KIANDRA REEFS AND THE ORIGIN OF THE GOLD IN THE LEAD.

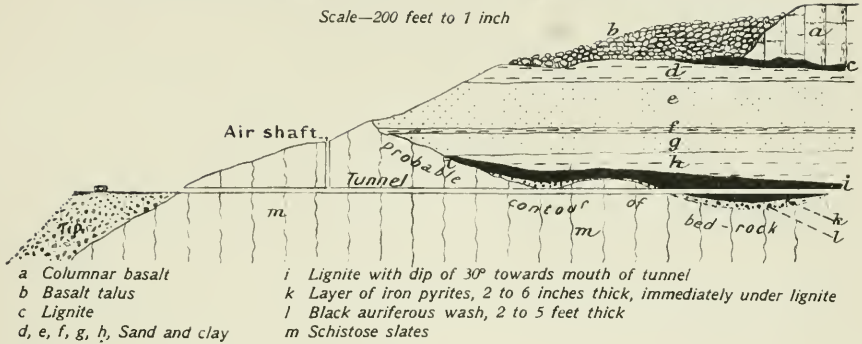
No payable auriferous reefs have been discovered in the neighbourhood of Kiandra, although reefs and lenticular patches of quartz exist in great quantity. A few gave good returns from surface crushings, but at very slight depths the gold contents became practically nil. Very rarely are the reefs in the form of true fissure veins. They occur mostly as silicifications, following the strike of the country; in fact, most of the slate country to the west of Kiandra is very altered, and is in places replaced to a remarkable extent by white quartz.

The Three Mile Reef was one that promised well at the start, giving splendid returns from surface crushings, as mentioned in the historical notes on the district. One hundred and twenty feet of outcrop were pegged out,

* W. H. J. Snee, Ann. Rept. Dept. Mines for 1898, p. 95.

Sketch Section across The Giandarra Workings

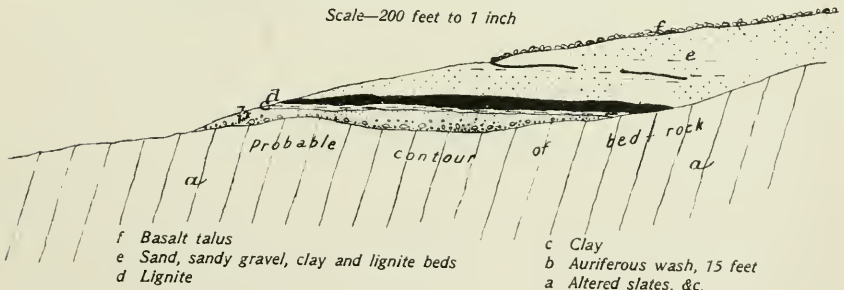
Scale—200 feet to 1 inch



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Sketch Section across The Six-mile Claim

Scale—200 feet to 1 inch



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HYDRAULIC SLUICING AT PATTINSON AND WINCKLER'S CLAIM.

and at a little depth the reef was proved over 10 chains of length. The vein was very pronounced, being 3 feet wide, and possessing a westerly dip.

Five hundred tons are said to have been obtained from this reef, with an average value of 15 dwt. to 1 oz. per ton.

The Charcoal Reef occurs in slates, and in the vicinity of a small granite boss, and also of a small patch of norite. The vein is not well pronounced. Good yields are reported from the surface stone. Fifty or 60 tons were crushed for an average of 2 or 3 oz. per ton. For these returns I am indebted to Mr. Eastwood, of Kiandra.

In the tuffs near the township various auriferous reefs occur.

One, in Pollock's Gully, about $\frac{1}{2}$ inch in width, is said to average some 10 dwt. per ton.

At Jackass Flat, in the river bed itself, a quartz vein was worked. From the cap of the reef 3 tons were crushed for a yield of 30 oz. per ton. Eight feet below the surface the gold apparently gave out. (Information supplied by Mr. Eastwood.)

Surface Hill Reef.—This strong reef occurs in the vicinity of the township itself, having a strike in a N.N.W. and S.S.E. direction, and a high angle of dip in a westerly direction.

The outcrop has been traced over a length exceeding 40 chains. It occurs in a thick belt of andesitic tuffs in the neighbourhood of a small norite boss, and is traversed by numerous slickensided faces.

Calcite is somewhat abundant. A large specimen, yielding 28 lb. weight of gold, was found lying immediately to the east of the reef cap. The reef has a poor appearance, and, on being tested, has yielded nothing of value.

Origin of the Reefs.—The country was folded by great granite intrusions (of which there is abundant evidence both to the east and west of Kiandra), and numerous fractures formed in the country rock, which were subsequently filled with quartz. Innumerable lenticular patches of quartz occur also in the slates to the west, which are due partly to the infilling of fractures and partly by secondary silicification setting in along lines of weakness.

There is every reason to believe that these lenticular quartz patches (as also reefs similar to the Three Mile, Jackass Flat, and Surface Hill occurrences) contained varying quantities of gold, and that as the slow process of denudation progressed, these quartz segregations were exposed and removed in turn, while their auriferous contents were carried into the lead.

METHODS OF WORKING THE KIANDRA LEADS.

Canvas hose for surface sluicing was used in the early days of the field. The hills around Kiandra are in places covered with lines of races, which follow the contour of the country for miles.

As the lead was worked farther into the hillsides, and the amount of overburden increased, this method of sluicing ceased to be effective.

The hydraulic system was then introduced. Dams were constructed, which, owing to the elevated position of the lead (about 5,000 feet above sea-level), allowed of rather restricted catchment areas. The excessive rain and snowfall of the district, however, and the little loss suffered by evaporation at this altitude compensate, in great measure, for the lack in area of gathering ground.

In the case of New Chum Hill, the Three Mile was selected as a suitable site for collecting water, a dam was erected, and a large head race was constructed 4 or 5 miles in length, wherewith to convey the water to treat the wash in the Homeward Bound and Cornishmen's Claims.

The catchment area of the Three Mile Dam is about 750 acres; that of Pig Gully about 550 acres. With a rainfall of 64 inches per annum, this would give a total of nearly 2,000,000,000 gallons if all the water falling on the area could be conserved. Probably, however, not more than one-half could be saved.

The Pig Gully Dam is not an accomplished fact, but an excellent site exists for constructing one, a natural retaining wall of slate running across the gully near its mouth, which, at a moderate cost, could be formed into a strong dam.

The head-race was 130 feet above the base of the wash in the Homeward Bound Claim.

With the water power gained by this height the lead was sluiced by nozzles. This method was effective until the overburden reached a thickness of 150 to 170 feet, at which points the wash was heavily capped with basalt. The latter has been found very difficult to cope with in quantity, and one by one, as the basalt became pronounced, the sluicing claims were abandoned, and tunnelling is being resorted to. (Plate V.)

Hitherto the various tunnels driven into the hills have, with one or two exceptions, been chosen in a most haphazard fashion.

The Empress Tunnel is one that was driven some 30 feet below the base of the wash, but in the direction of down, instead of up, stream, so that, sooner or later, it must pierce the wash. Whereas it was started 30 feet below the drift, in the farthest point yet reached it is but 4 ft. 6 in. below the channel.

The method of working adopted here was the driving of the low-level tunnel (mentioned in previous paragraph) for a distance of 2,000 feet, and the putting up of rises at short intervals into the drift. An upper tunnel was driven along the deepest part of the channel, cross drives being put in at short distances on both sides of this level. The wash is extracted by the system known locally as "panelling." Three or 3½ feet depth of wash are blocked out, laths being placed vertically 1 foot apart to support the overlying mass. As the "panelling" progresses, the wash crushes the laths and settles down.

The Giandarra is worked on a similar principle; but in other cases the tunnels have been driven at levels altogether too high to win the wash. These serious blunders arose from a desire not to encounter very hard bed rock in tunnelling.

In a country like Kiandra, possessed of great rain and snowfall, where the columnar basaltic capping allows of ready percolation of surface waters through the interstices between the columns into the underlying drift, it is absolutely essential to have a lower tunnel well below the wash.

Not only must this tunnel be below the general level of the channel, but also below any deep potholes which may reasonably be expected to occur in the bed of the lead. Thus, for instance, a large one, 20 feet deep, occurs in the Homeward Bound, and in modern river beds large holes occur quite 50 feet in depth. These, if not taken into consideration, may be tapped by the lower tunnel, causing imperfect drainage, thereby hindering the work.

From the northern extremity of Township Hill the lead rises towards the North Bloomfield.

It has been suggested to work the wash in Township Hill by carrying a wide low-level tunnel into the hill, and 50 feet below the base of the wash (which, by the way, has not yet been ascertained), to connect the same with an upper tunnel in the wash by means of passes put up at every 50 or 100 feet, to develop as much ground as will give employment to 150 men blocking out, and 70 to 80 truckers, and to utilise the lower level for sluicing purposes.



EXPOSURE OF LEAD IN WHIPSTICK GULLY.

For treating the wash on such an extensive scale, the northern point of the hill would form as convenient a spot as could be chosen at which to commence operations, since at this point the upper part of the lead is exposed in natural section, there is a good get away for the tailings, and the town would suffer no inconvenience.

Similarly, a tunnel driven well below the wash in Pattinson & Winckler's Claim would command the lead in New Chum Hill, for the fall thence to the Giandarra is but 21 feet.

The amount of water which can be conserved in the Three Mile, Pig Gully, and Eight Mile Dams should meet the requirements of the Township and New Chum Hill tunnels.

TOWNSHIP HILL.

Special notice is called to the northern part of this hill, inasmuch as—

- (1.) It is the point at which tunnels are proposed to be driven in to work the lead.
- (2.) It is not easy to locate the main channel amid such abundant evidences of lignite and wash as occur in this portion of the hill.

The points of occurrence of lignite, clay, and wash may be again enumerated:—

- (a) Head of Pollock's Gully.
- (b) North-east point of hill and 15 chains south; also towards Pollock's Gully. (Plate VI.)
- (c) Jack's Gully, midway between north-east and north-west portions of hill.
- (d) G. L. 60.
- (e) Basalt claim and tunnel.

If we dismiss from consideration the wash in the Basalt Claim and tunnel as being tributary to the main lead, though even in these cases the drift is similar to, and but a very few feet above the base of the wash in the main channel, then we have to face the fact that thick masses of drift occur at almost every point on the hillside beneath the basalt, which is from 40 to 50 chains wide at this point.

Three solutions as to the course of the channel may be given:—

- (1.) The whole width of the basalt at this extremity of the hill, and for some 80 chains southward, may contain river drift beneath its mass, representing a local broadening of the stream.
- (2.) A main channel may exist, represented in direction by the outcropping of lignite at the heads of Whipstick and Pollock's Gullies, and with a great amount of river drift to the east as far as G.L. 60.
- (3.) The channel may consist of two loops, one passing through Pollock's Gully and Township Hill tunnel, the other passing through G.L. 60 and Jack's Gully, and effecting a junction with the first near the north-east point of the hill.

There seems to be no doubt as to the existence of an eastern channel, inasmuch as Township Hill tunnel has proved a thick body of river wash, enclosed by a high wall of bed-rock to the east, this bed-rock persisting almost the whole distance to Pollock's Gully, and 100 feet higher than the base of the drift, the presence of river material being again demonstrated at the head of the gully.

The ground, however, at G L. 60 should be prospected well, to form some idea as to the extent of the wash there.

THE ROUND MOUNTAIN LEAD.

EXTENT.

About 15 miles south-west of Kiandra and near the Round Mountain, wash was discovered under a huge basalt covering. Three miles to the north river drift occurs in great quantity under the basalt, and may be traced for a distance of over 40 chains. The claims of the Phœnix and Golden Crown have been worked here, and are about 700 feet above the Tumut River. A moderate slope from the claims leads to the top of a long ridge stretching north and south for miles. This is composed of basalt, and at the summit is more than 1,000 feet higher than the top of the wash. The basalt, however, is not necessarily 1,000 feet in thickness, but may be of wedge shape in section, owing to the bed rock having an uneven surface, and there is little doubt that originally it was of very great thickness, since the thinnest portion now is over the lead itself. The basalt from this point passes in the direction of the Eight Mile with a break in its continuity where the Tumut Gorge occurs (2,500 feet deep). The basalt caps the gorge on each side and river wash may be picked up under the basalt on each side of the river slopes. At this gap and towards the north the cap is from 2 to 3 miles in width. Abundance of wash occurs at the Eight Mile similar in all respects to that at the Fifteen Mile, and overlain by similar basalt from 100 to 200 feet thick. A great break occurs at this spot in the basalt, the Tumut Ravine, which cuts across its path again, is here over 2,000 feet deep. Some miles to the north-west it is again picked up at New Meragle. Here it has a great superficial extent, but never appears to be more than 100 to 150 feet in thickness. Tunnels driven under it have proved the existence of considerable quantities of earthy lignite, sand, and wash. I am informed by Mr. Thomas, of Lobb's Hole, and Mr. Cook, of Meragle, that this basalt flow can be traced thence for 20 or 25 miles, with an average width of from $1\frac{1}{2}$ to 2 miles, towards the Cherry Tree Hill basalt, near Batlow, under which payable wash is being worked.

By aneroid readings the Fifteen Mile and Eight Mile workings appear to be on nearly the same level, and reach 750 feet below the Empress Claim wash. The lignite and clay at New Meragle are some 900 feet lower again. Cherry Tree Hill and Tumberumba occupy still lower levels.

The course of the old river thus appears to have been from the Round Mountain neighbourhood, through the Fifteen Mile, Golden Crown, Phœnix, Eight Mile, and New Meragle Claims, and thence possibly in the direction of Cherry Tree Hill.

DESCRIPTION OF CLAIMS.

1. GOLDEN CROWN AND PHŒNIX.

Great bodies of wash have been sluiced away at both these claims. Hydraulic sluicing was employed at the former claim. Mr. J. M. Lette, the proprietor, is preparing to work the properties again by similar methods.

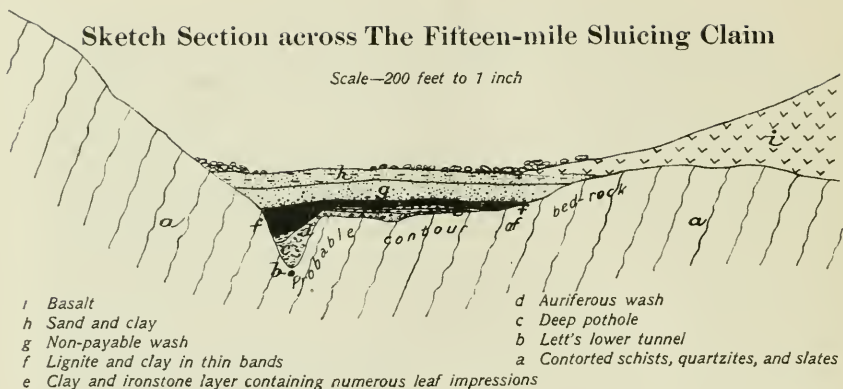
In the Golden Crown a deep V-shaped depression occurs some 100 feet below the general level of the channel bed. This may represent the gutter, but is more likely to prove a very deep pothole. Various tunnels were driven in from the creek running through the property to win the gold contained in the depression. The lowest one was put in about 800 feet to command the wash. This answered very well until the roof fell in, upon which work was abandoned for a while.

The layers of wash, lignite, clay, and sand, are as well marked in both claims as in the Kiandra Lead.



Sketch Section across The Fifteen-mile Sluicing Claim

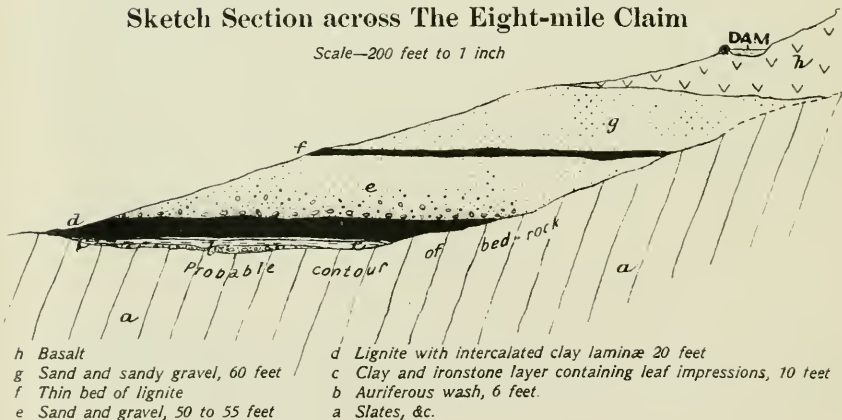
Scale—200 feet to 1 inch



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Sketch Section across The Eight-mile Claim

Scale—200 feet to 1 inch



61375

There is a marked difference, however, in their characters, the lignite being harder in the Fifteen Mile, and consisting of very thin layers intercalated with very thin clay seams.

Two beds of auriferous wash occur, one above and one below the lower carbonaceous layer. Both, however, are very poor as compared with the wash found in the New Chum and Empress Claims.

A seam of indurated clay or impure ironstone, 12 inches thick, and occurring between the lowest wash and lignite, has always hampered sluicing operations owing to the difficulty in removing by ordinary means. This seam contains numerous well-preserved specimens of leaves.

The clayey lignite and wash in the depression mentioned before possess most pronounced dips.

THE EIGHT MILE.

Gold was traced up a creek from the Tumut River to the wash in this claim. The section yielded by sluicing operations is very similar to those of the Fifteen Mile Claims, the clayey lignite seam, the "cement" or impure indurated ferruginous clay seam, and the occurrence of poor wash both above and below the lignite, being almost indistinguishable in the two localities.

Great quantities of dirt have been treated by hydraulic sluicing. Trouble was experienced by the continual fall of trees and logs into the claim as sluicing operations made progress, and also by the persistence of the "cement" which proved so troublesome in the sluicing of the Fifteen Mile Claims.

The returns from this claim were not satisfactory.

NEW MERAGLE.

Thompson and Howard's Claim is some 3 miles distant from the Tumut River, and 2,200 feet above its junction with the Yarrangobilly River.

A large sheet of basalt has here formed a small tableland. Towards the river the basalt has been cut through by local streams, and on the slope below the local cap river wash consisting of sand and pebbles is seen. Small shafts have been sunk here but without reaching the base of the wash.

Three tunnels have been driven in the side of the hill about 300 yards from the break in the basalt. The upper one was driven into a solid seam of clayey lignite similar to that in the Fifteen and Eight Mile Claims.

A lower tunnel was then put in, but still too high. Another one is being driven 50 feet lower. This has passed through solid gneissic granite for a distance of 300 feet. It is expected that the tunnel will have to be continued for a further 200 feet before reaching the wash. This tunnel is probably low enough to work the wash, unless the lignite seam passed through proves to be the upper layer instead of the one immediately overlying the "cement" and lower wash.

CONCLUSION.

We may summarise as follows:—

- (1) Two well-defined leads exist in the Kiandra district, one passing through the Nine Mile, Township, and New Chum Hills, the other by way of Round Mountain, the Fifteen Mile, the Eight Mile, and New Meragle.
- (2) Both have a distinct fall from south to north; they are each capped by basalt; the made ground in each case is some 150 feet in thickness, confined between narrow banks, and composed of auriferous wash, carbonaceous clay, sand, and adhesive clay layers.

- (3) The auriferous nature of each was suspected by tracing gold up the present watercourses to the basalt cap.
- (4) Wherever proved, the channel is more or less auriferous.
- (5) The Empress Claim and the northern portion of New Chum Hill are the only places really opened up along the line of the Kiandra Lead. Many thousands of superficial yards have been sluiced away at the New Chum Hill properties, and this after the richest portions of the channel had been blocked out by Drummond and party, Colquhoun and party, and others. The returns, taken from the Companies' books, show a gold yield of 6,965 ounces for a treatment of 52,200 superficial yards.
- (6) The auriferous wash is not confined to a narrow gutter, but is distributed over an uneven bed varying from 50 to 100 yards in width.
- (7) There is every reason to believe that the wash from Pattinson and Winckler's Claim towards the Giandarra will be very similar to that found in the former claim, as also to that at the Homeward Bound.
- (8) Made ground occurs throughout the whole of the north end of Township Hill, and it is proposed to work the wash contained therein by means of a long low-level tunnel driven in at the north-east corner.
The chief difficulties to be encountered in this work will probably consist of the great distribution of river drift over an uneven bottom.
- (9) An equally good, if not better, scheme would be to block out the wash from Pattinson and Winckler's Claim towards the Giandarra, the fall in the channel not exceeding 22 feet.

DESCRIPTION OF PLATES.

Frontispiece. New Chum Hill, showing open cuts from the south.

1. Kiandra Bucket Dredge, from Whipstick Flat.
2. Kiandra Township and Eucumbene River from the south.
3. "The Walls," Lobb's Hole.
4. Homeward Bound Open Cut.
5. Hydraulic Sluicing in Pattinson and Winckler's Claim.
6. Exposure of Lead at head of Whipstick Gully.



GEOLOGICAL MAP

(With Section)
OF THE

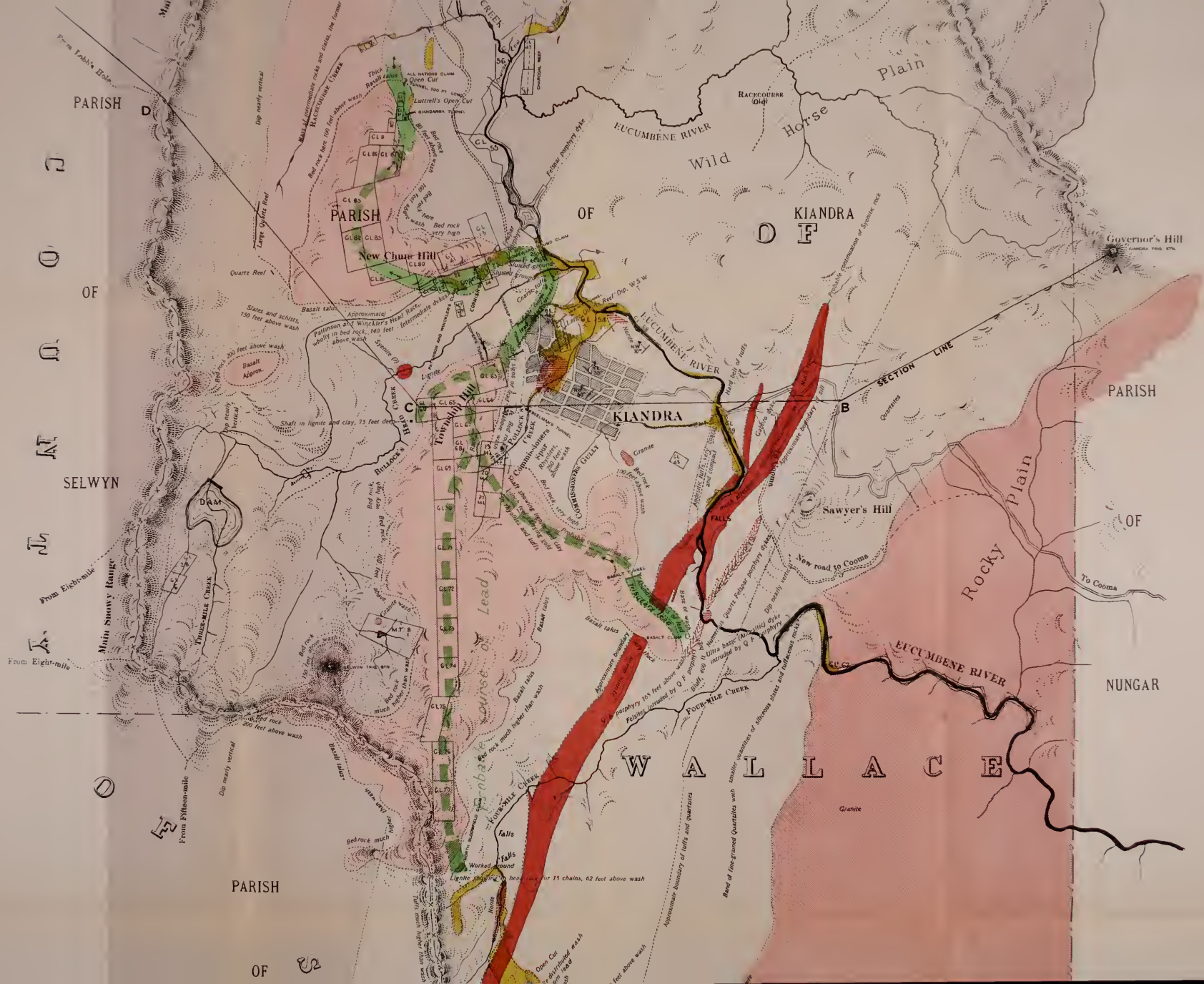
KIANDRA GOLD FIELD

By E. C. ANDREWS, B.A., Geological Surveyor, assisted by C. E. MURTON,
Field Assistant.

Prepared under the direction of E. F. PITTMAN, A.R.S.M., Government Geologist,
Department of Mines and Agriculture, Sydney, 1901.

Scale 0 20 40 60 80 Chains





PARISH

OF

SELWYN

PARISH

OF

OF

KIANDRA

PARISH

OF

NUNGAR

KIANDRA

WALLACE

Plain

Wild Horse

Rocky plain

Governor's Hill

SECTION LINE

Quartzes

Sawyer's Hill

New road to Cooma

EUCUMBENE RIVER

Granite

PARISH

New Chase Hill

Lignite

Township Hill

Basalt

Basalt

Basalt

Basalt

Basalt

Basalt

Basalt

Basalt

Basalt

Basalt

Basalt

Basalt

Basalt

Basalt

Basalt

Basalt

Basalt

Basalt

Basalt

From Eight-mile

Main Snowy Range

From Fifteen-mile

Dip nearly vertical

20 feet above wash

20 feet above wash

20 feet above wash

20 feet above wash

20 feet above wash

20 feet above wash

20 feet above wash

20 feet above wash

20 feet above wash

20 feet above wash

bedrock much

worked around

Lignite

Lignite

Lignite

Lignite

Lignite

Lignite

Lignite

Lignite

Lignite

Lignite

Open Cut

Open Cut

Open Cut

Open Cut

Open Cut

Open Cut

Open Cut

Open Cut

Open Cut

Open Cut

Open Cut

Open Cut

Open Cut

feet above wash

feet above wash

feet above wash

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feet above wash

Approximate boundary of lead and quartzes

Band of fine-grained quartzites with small quantities of lead and iron pyrites

Approximate boundary of quartzes

Approximate boundary of quartzes

Approximate boundary of quartzes

Approximate boundary of quartzes

Ultra base (metre) dyke intruded by G.F. phony

Quartzes (fine primary) dyke

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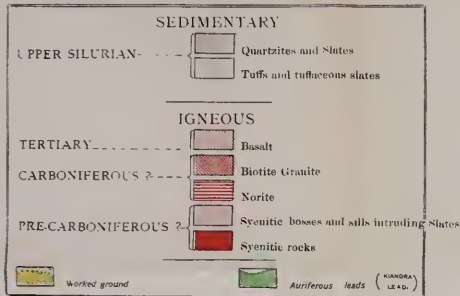
Quartzes (fine primary) dyke

Quartzes (fine primary) dyke

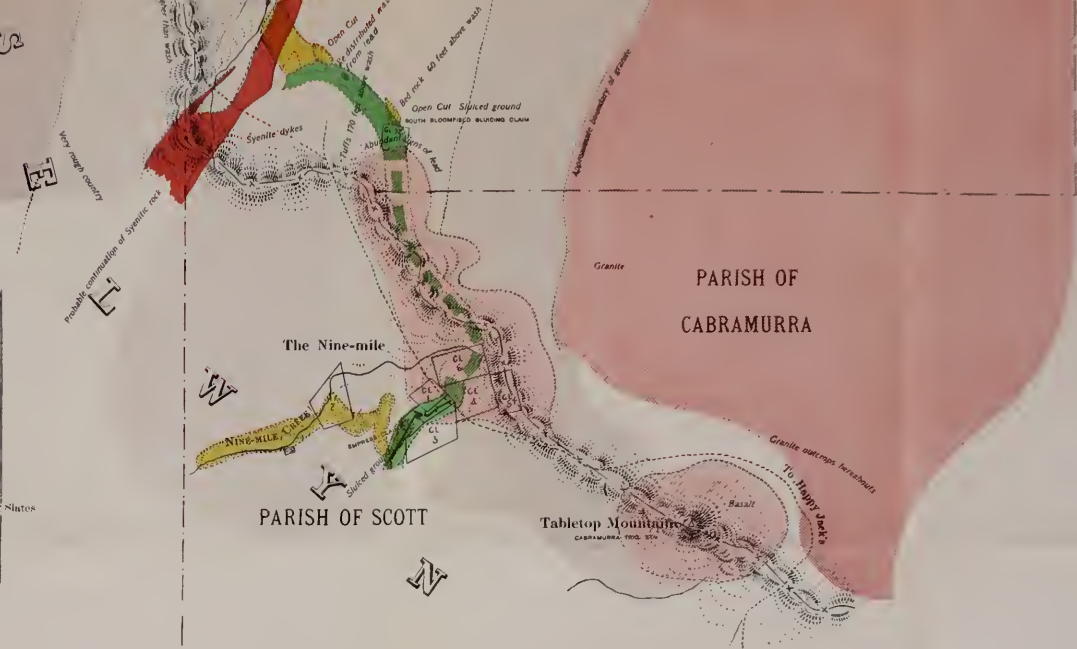
Quartzes (fine primary) dyke

TABLETOP

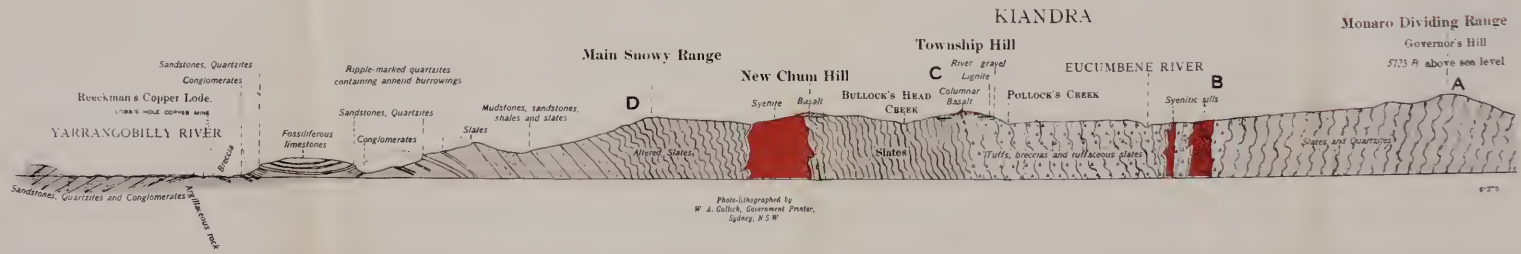
REFERENCE



NOTE - Slate indicated by solid purple is fissile, while that shown by purple dots with lines is non-fissile and very siliceous



SECTION From Lobb's Hole Copper Mine to Governor's Hill



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